ISSN 2730-2601
RICE Journal of Creative Entrepreneurship and Management, Vol.1, No.1, pp. 30-40,
January-April 2020

doi: 10.14456/rjcm.2020.3

A Study of Guidelines for the Development of School Botanical Gardens in Prachuap Khiri Khan Province

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Abstract

This research aimed to study the current conditions and management of botanical gardens in schools in Prachuap Khiri Khan Province, and to develop guidelines for the effective operational methods of the school botanical garden in Prachuap Khiri Khan Province. This research used both quantitative and qualitative methods. The subjects were 400 students selected by multi-step random sampling from eight schools in Prachuap Khiri Khan Province. They were to provide quantitative data by responding to the questionnaire. The total of 38 subjects—18 executives, teachers, and 20 experts--gave qualitative data by semi-structured interview. Quantitative data were analyzed by frequency, percentage, mean, standard deviation, t-test value, F-test, and qualitative data by content analysis. The results of the study revealed the highest demand of school botanic gardens in four areas: (1) more plants in a botanical garden, (2) clear signboards on plants for visitors, (3) appropriate classification and grouping of plants by region, and (4) sitting or resting areas. The interview results highlighted a need for a management for the school botanical garden in four aspects: (1) plant management in the garden, (2) administration of the botanical garden area, (3) utilization management, and (4) facilities for botanical garden school administration. The obtained findings were to generate guidelines for the development of botanical gardens to suit schools in three aspects: (1) resource, (2) utilization, and (3) creation of awareness.

Key words: *Development guidelines, school botanical garden,gardent administration, Prachuap Khiri Khan Province*

1. Introduction

Rajamangala University of Technology Rattanakosin (RMUTR) is one of the agencies participating in the Plant Genetic Conservation Project under the Royal Initiation of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG). The five-year master plan (2016-2021) and the participatory process of the participating agencies were to conserve and develop plant genetic resources of the country to be sustainable heritage and raise the public's awareness of plant genetic conservation. In putting projects and activities into reality, those agencies in charge have integrated botanical garden projects into school planning and administration. In this regard, Rajamangala University of Technology Rattanakosin has campaigned and promoted activities in the form of youth and general public training programs for the conservation of local plant genetic resources (Simachokdee, 2002). The University has followed some royal ideas on plant genetics conservation, particularly on teaching and training children to be conscious of the conservation

of plants and enjoy the beauty of nature and gardening work. This is also to help school children to understand the significance of plant conservation while reducing stress experienced in school life and demands from family (Crane, et al., 2009; Chinariyarit et al, 2017).

2. School Botanical Garden Project

"School Botanical Garden" is one of the activities meant to conserve plant genetics by exposing the youth to the flora and beauty of nature in support of further conservation of plants in the school garden area. The school botanical garden project can be used as part of learning subjects in the basic education curriculum (Ruangdetsakul, 2009; Naksen, 2013). It houses a collection of living plants, stores information on plants, and supports continuing education. Samples of dry, local plants are collected and planted in the school. Students will do local wisdom report recoded plant data and their new learning knowledge. There is a study corner for teaching and learning media in various subjects in accordance with local conditions. The botanical garden project brings awareness to students not to violate nature and to be ready for volunteer work in public interest (http://www.rspg.or.th/botanical_school/school_bot_11.htm: Retrieved January 12, 2019).

The school botanical garden project in Prachuap Khiri Khan Province had nine schools: (1) Wang Klai Kangwon School, (2) Ban Madue Thong School, (3) Ban Thung Yao School, (4) Ban Tha Kham School, (5) Ban Suan Luang School, (6) Ban Klong Loi School, (7) Ban Nonghoi School, (8) Prachuap Wittayalai School (Muang District), and (9) Ban Khao Chao Border Patrol Police School. The participating schools were able to carry out the project on their own, but were not systematically evaluated to what extent their project operation met the criteria of the Plant Genetic Conservation Project under the Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG). As kown, there have been questions about the development and strengthening of operational facilities to be utilized in raising awareness of plant genetic conservation, and enhancement of the learning process of natural resources. In addition, people queried about management efficiency through participation of all departments and personnel in particular schools. In their views, there could be limitations arising from the lack of readiness of personnel in the project operation, and the lack of integrative knowledge and expertise in plant species analysis. For all these issues mentioned above, the researcher felt the urgent need to investigate the project's administration with a review on the management model of botanical gardens used in schools in Prachuap Khiri Khan Province. The researcher would seek both quantitative and qualitive data. It was expected that the obtained information can serve as as a guideline for the schools participating in the botanical garden project to operate their school's botanical garden effectively, and expand the project's operation to other external communities to help conserve local plant genetics nationwide.

3. Research Objectives

The study had three objectives:

1. To identify the current condition and existing problems in the operation of the school botanical garden in Prachuap Khiri Khan Province.

2. To study the operational administration of the school botanical garden in Prachuap Khiri Khan Province

3. To create a guideline for the management model of the school botanic garden in Prachuap Khiri Khan Province for efficiency in operations.

4. Research Methodology

4.1 The Participants

The population used in this research were administrators, faculty body and students at nine schools operating a botanical garden in Prachuap Khiri Khan Province.

The participants providing quantitative data were students at eight schools operating a botanical garden in Prachuap Khiri Khan Province. For the sample group, the researcher used the formula after Nara Srivaiwanichkul And Chusak Udomsri (2009).

$$\frac{P(1-P)Z^2}{e^2}$$

Which assigned n = Sample size
P = Proportion of the population for radomizing
Z = Confidence level set by the researcher
e = Expectation value

The researcher determined the confidence value at 95% with 5% anticipation. The number of samples calculated was 380.16 people, but in this study, the researcher assigned a sample of 400 people using a multistage sampling method of random sampling. The researcher used three steps as follows.

Step 1: Determined the area for the research by selecting the specific area of Prachuap Khiri Khan Province which consists of eight districts, namely Muang District, Kuiburi District, Thap Sakae District, Sam Roi Yot District, Pranburi District, Bang Saphan District, Hua Hin District, and Bang Saphan Noi District.

Step 2: Drew a lottery for nine schools in Prachuap Khiri Khan Province to collect quantitative data .

Step 3: Divided the proportion of the sample group in each district to obtain the sample group in eight schools, 50 students, totaling 400 people by the simple random sampling method.

As for the participants to provide qualitative data, the researcher used a convenience sampling method to obtain:

(1) Eighteen administrators and teachers in schools operating the botanical garden in Prachuap Khiri Khan Province, and

(2) Twenty experts in botanical garden.

4.2. Research Instruments

The quantitative research had three parts:

Part 1 on the participants' general information on gender, age, education level, purpose of using the school botanical garden, and influencing persons on the use of the school's botanical garden.

Part 2 on the participants' viewpoints on the needs of the operation of the botanical garden management in schools in Prachuap Khiri Khan province on the scale of 1-5 with the following scoring criteria:

Score	**Level of need**
5	most
4	very
3	moderate
2	low
1	very low

The researcher set the interval of scores as follows:

Interval score	**Level of need**
4.51-5.00	most
3.51-4.50	very
2.51-3.50	moderate
1.51-2.50	low
1.00-1.50	very low

Part 3 on the participants' other suggestions.

The qualitative part gathered information from documents and research papers related to the operation of the botanical garden, and semi-structured interview questions to collect data on the operation of the botanical garden in eight schools in Prachuap Khiri Khan Province.

4.3. The Research Instrument contruction

The researcher used five steps in constructing the instruments to collect quantitative and qualitative data as follows:

1. Studied information from books, documents, concepts, theories and related research create the questionnaire to cover research objectives.

2. Created the questionnaire and consult with experts in verifying coverage and content validity and adjusting the questionnaire as suggested for the final version.

3. Calculated the confidence value of the questionnaire.

4.4. Instrument Quality Testing

The researcher used three experts in botanical garden to verify consistency of the research objectives, and calculated consistency value (Item-Objective Congruence Index: IOC) of the questions used between 0.60 - 1.00, as the quality criteria for data collection.

For the confidence level of the questionnaire, the researcher tried the questionnaire with a group of 30 students in the area, with the same characteristics as the sample group. The confidence value of the whole questionnaire was at 0.887.

5. Data Collection

The researcher collected both quantitative and qualitative data in the following steps:

5.1 Collected from primary sources by interviewing school administrators, teachers, experts in botanical garden, and some students in schools in Prachuap Khiri Khan Province.

5.2 Collected from secondary sources by studying documents, and research theories related to school botanical garden work.

This study used both quantitative and qualitative data for a complete picture of the operation of the botanical garden project in Prachuap Khiri Khan Province.

6. Statistics Used in Data Analysis

The researcher used both descriptive abd inferential statistics to analyze quantitative and qualitative data as follows:

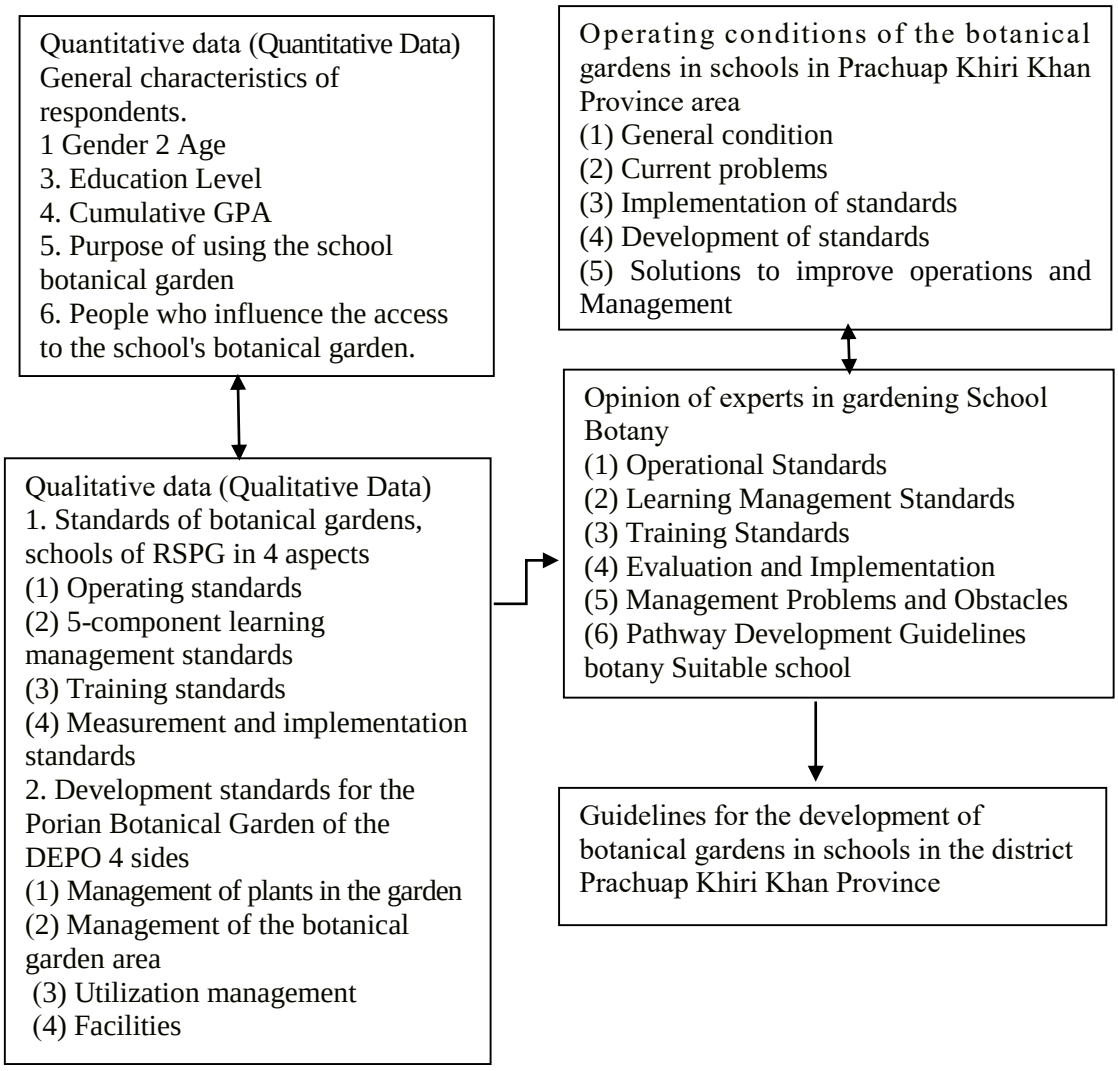
1. Used descriptive statistics to analyze quantitative data by frequency, percentage, mean and standard deviation to describe the needs of those involved in the administration of the botanical gardens in schools in Prachuap Khiri Khan Province.

2. Used inferential statistics with the data in the questionnaire parts 1 and 2 to compare differences between the means of two independent sample groups. The researcher tested the value of t (Independent Sample t-test) for testing the gender hypothesis. Differences were compared between two or more samples using ANOVA one-way analysis of variance.

7. Research Conceptual Framework

The researcher used methods of both quantitative research and qualitative research. The researcher established a conceptual framework as a guideline in the study as follows.

Figure 1: Research Conceptual Framework



8. Data Analysis and Research Results

The researcher followed the study conceptual framework shown in Figure 1 and analyzed the obtained data in response to the research objectives. The results of data analysis were divided into four parts.

8.1. **Part 1.** The researcher reported the results of the qualitative data analysis from the interviews.

8.1.1. General Condition of School Botanical Garden

8.1.1.1. Number 9 provincial school [Ban Khao Chao Border Patrol Police School] in Prachuap Khiri Khan gave preliminary information on its botanical garden within school under the RSPG guidelines.

8.1.1.2 The school has managed the botanical garden continuously since 2016. In the past, a small botanical garden was built and developed for students and school personnel to learn that the size and suitability of the botanical garden in the early stage.

8.1.1.3 The administration and system of the botanical garden have been designed to meet the main objectives of the operation. Arranged by the RSPG guidelines were a building for learning, plan for visitors, labels for flowers, ornamental plants and perennials in the gardens. Thai names, official English names and the birthplace-based names were used to create long-term recognition and knowledge of people who visit the school's botanical garden.

8.1.1.4 There was an operation of the botanical garden within the school on the basis of a short-term, medium-term and long-term program having been established. Such planning was in conjunction with the Ministry of Education's basic education curriculum management.

8.1.2. Existing Problems of School Botanical Garden

8.1.2.1 Procurement of rare plants or local plants grown in schools may not be comprehensive due to limited personnel of the school.

8.1.2.2 The scope and size of the school may require proper management of the botanical garden.

8.1.2.3 Lack of plant family analysis expertise and lack of readiness of some personnel in terms of understanding of the project’s significance.

8.1.2.4 Not up to expected standards of school botanical garden by the RSPG guidelines

8.1.2.5 Other problems related to budget, some personnel’s cooperation, maintenance of water and fertilizer, adjustment of school layout and landscape, and some limitations of the project being integrated into the main instruction of the basic education curriculum.

8.1.3. Guidelines for the Standard Development of the School Botanical Garden

According to experts, the guidelines for the development of school botanical gardens include operation methods and procedures, and pattern of management in accordance with the master plan of RSPG on (1) resource framework, (2) utilization frameworkand, and (3) creating awareness framework.

8.2. Part 2. The researcher reported the results of the quantitative data analysis from the questionnaire on the need for the operation of the botanic garden management in schools in Prachuap Khiri Khan Province as shown in Table 1.

Table 1: Results on the Need for the Administration of Botanical Garden in Schools in Prachuap Khiri Khan Province

Item	Needs for Operation of Botanical Garden Management in Schools in Prachuap Khiri Khan Province	$\bar{x}$	*SD*	Level of need	Rank
1	Management of plants in the garden	4.03	0.59	very	4
2	Administration of the botanical garden area	4.09	0.61	very	3
3	Utilization management	4.32	0.57	very	1
4	Facilities	4.27	0.46	very	2
	Total	**4.18**	**0.40**	**very**	

Table 1 reports the overall demand for botanical garden management in schools in Prachuap Khiri Khan province at a high [very or much needed] level ($\bar{x}$ = 4.18, S.D. = 0.40). The four items reveal high [very or much needed] levels accordingly: utilization management ($\bar{x}$=4.32, S.D. = 0.57), the facilities ($\bar{x}$ = 4.27, S.D. = 0.40), the administration ($\bar{x}$ = 4.09, S.D. = 0.61) and the management of plants in the garden ($\bar{x}$ = 4.03, S.D. = 0.59).

8.3. Part 3. The researcher reported the results of comparison of the needs for the implementation of botanical gardens in schools. Table 2 shows four items [reported earlier in Table 1] were significantly different from each other at the level 0.05.

Table 2: The results of the comparison of the needs of the administration of the botanical garden in schools in Prachuap Khiri Khan Province

Source of Variance	SS	df	MS	F	Sig
Management of plants in the garden					
Between groups	6.934	3	2.311	6.830	0.000
Within the group	134.009	396	0.338		*
Total	140.942	399			
Administration of the botanical garden area					
Between groups					
Within the group	50.195	3	16.732	64.688	0.000
	102.425	396	0.259		*
Total	152.620	399			
Utilization management					
Between groups	58.580	3	19.527	102.564	0.000
Within the group	75.392	396	0.190		*
Total	133.972	399			
Facilities					
Between groups	65.715	3	21.905	389.308	0.000
Within the group	22.281	396	0.056		*
Total	87.996	399			
All items included					
Between groups	26.831	3	8.944	93.519	0.000
Within the group	37.871	396	0.096		*
Total	64.702	399			

8.4. Part 4. The researcher reported the results as related to the guidelines for the development of botanical gardens for schools in Prachuap Khiri Khan Province on the following points:

1. Administration of the botanical garden was to integrate the project into activities in different learning groups by using the standard format of RSPG program activities (Chen & Sun, 2018).

2. The project was to include student needs in developing their school botanical gardens as pertinent to the local area or community by (1) bringing ornamental plants to plant in botanical gardens, (2) providing appropriate signs and labels for plants and their positions, (3) arranging sitting or resting areas for visitors, and (4) sequencing and classifying plants by group or region.

3. The project was to integrate its contents and activities into the basic education curriculum with emphasis on learning resource, community development, and environmental conservation (Pholsri, 2004).

9. Discussion of Results and Conclusion

From the results of the study reported in Section 8 above, it is worth mentioning that the bonatical garden project in fact aims at educating visitors with knowledge of local and rare plants to value their natural treasure and environment and create long-term recognition (Richard et al., 2009). In particular, the school is expected by RSPG guidelines to take into account the integration of teaching and learning science, effective management of the botanical garden in the school, and the development of environmental science learning resources for the community (Pholsri, 2004).

The information on demand development of school botanic gardens in Prachuap Khiri Khan Province shows that students who are studying at different grade levels of both junior and senior high schools were positive to the implementation of the project. They required effective management approach to make it acceptable for students' appreciation, as earlier reported in the work of Techakomol (2015). In this regard, the schools with such a project looked for a good management model of the botanical garden project to adopt and modify to suit their school context. From the interview data, Kaeng Nuea Pittayakom School Ubon Ratchathani Province could serve as a good model on the basis of high satisfaction of students, school personnel and stakeholders involved.

As for people who could influence the implementation of the botanical garden in schools in Prachuap Khiri Khan Province, this issue could vary with different students' characteristics, behaviors and their assigned duties in the botanical garden area. The project supervisor or the leading teacher as well as botanical garden experts could inspire students with a sense of pride and social responsibility for their national treasure, specific challenging assignments, and good peer interactions while working on the project, as earlier emphasized by Patcharakul (2014). The method of project assessment in teaching and learning could be

in the form of school activities used at Thairath Wittaya School 23 (Wat Khok Node, 2013) in Academic Year 2013.

The study found that the preparation and use of teaching plans, teaching media, and learning resources could improve the teaching quality for the botanical garden activities at Thairath Wittaya School 23. It should be noted that the teaching behavior of teachers before and after the project was of prime importance as it affected the students' academic achievement as well (Wat Khok Node, 2013).

The researcher considered the evaluation model as vitally important to enable the schools and concerned stakeholders in the community to understand the value of the botanical garden project and the schools' efforts in implementing the project. This can lead to continuous improvement and result in long-term benefits for students. This is in accordance with the research of Tiangsakul et al. (2016) who discussed the model for the evaluation of the school botanical garden project and proposed garden development in the discipline of Botany in the form of a sustainable learning life science center.

10. Research Recommendation

Based on the obtained findings, the researcher would like to suggest a careful planning for suitable number and diversity of plants inthe school botanical garden so that sufficient care could be efficiently handled by those assigned students and teachers in particular schools. As for visitors or community frequenters, the schools could arrange for visit hours and responsible personnel to supervise the botanical garden tour, and feedback form could be used by visitors for the schools to receive relevant feedback for improvement in services.

As for facilities for visitors as mentioned in the questionnaire and interview data, the schools might have to handle a reasonable budget as well as seek help and advice from the communities concerned. This could be done with small group discussions with community leaders, relevant stakeholders, school administrators, teachers, and students to find suitable solutions in particular school contexts. The researcher would recommend further research into effective or challenging activities in the botanical garden project as well as the assessment or evaluation methods for various aspects of the project's operations.

11. Acknowledgment

This research was funded by a research grant from Rajamangala University of Technology Rattanakosin. The researcher would like to thank the University most sincerely for the financial support for the project.

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